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Maternal mortality in South Africa

- Controversial issue
- Several sources:
  - Vital registration
  - Census and surveys
  - Demographic Surveillance System
  - Hospital data
- Levels, Trends, Differentials
  - Major discrepancies on levels
  - Agreement about recent increase
  - Very large differences (regional, socio-economic status …)
Issues related with maternal mortality in developing countries

- Case definitions
  - Demographic: “Pregnancy related death” (any death during maternal period) = direct + indirect + fortuitous
  - Medical: “Direct obstetric causes”
  - Major issue in case of high young adult mortality (HIV/AIDS + external causes)

- Changing relationship with socio-economic status, because of the HIV/AIDS epidemic
  - General issue for causes of death
  - Particularly relevant for maternal mortality

Census data on maternal mortality in South Africa

- Recent sources:
  - Census, 2001 (1/10 sample available)
  - Community Survey, 2007 (1/43 sample)

- Both include:
  - Births in past 12 months
  - Deaths in past 12 months
  - Maternal deaths, for women aged 12-50 / demographic definition = Deaths during pregnancy, delivery or within 6 weeks of delivery / No information on direct and indirect causes
  - Deaths from external causes (accidents and violence)

- Allows to compute all maternal mortality indicators
  - MMR: maternal mortality ratio
  - MDR: maternal death rate
  - MMR: life time risk (maternal mortality quotient)

- Allows differential analysis
  - Variety of socio-economic factors in census
  - Available only at household level for maternal deaths

- Allows multivariate analysis
  - Compares cases (maternal deaths) with controls (women who delivered in past 12 months and survived)
Results: fertility and mortality

<table>
<thead>
<tr>
<th></th>
<th>Census, 2001</th>
<th>CS, 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>991,543</td>
<td>246,618</td>
</tr>
<tr>
<td>Fertility (CBR)</td>
<td>22.8</td>
<td>24.0</td>
</tr>
<tr>
<td>Mortality (CDR)</td>
<td>9.3</td>
<td>15.3</td>
</tr>
<tr>
<td>Male, $45q_{15}$</td>
<td>440</td>
<td>606</td>
</tr>
<tr>
<td>Female, $45q_{15}$</td>
<td>320</td>
<td>501</td>
</tr>
</tbody>
</table>
### Results: maternal mortality

<table>
<thead>
<tr>
<th></th>
<th>Census, 2001</th>
<th>CS, 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nb maternal deaths</td>
<td>508</td>
<td>168</td>
</tr>
<tr>
<td>Percent time in maternal period</td>
<td>7.1%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Proportion of maternal deaths</td>
<td>6.4%</td>
<td>4.3%</td>
</tr>
<tr>
<td>MMR / 100,000</td>
<td>542</td>
<td>702</td>
</tr>
<tr>
<td>95% CI</td>
<td>497-591</td>
<td>603-816</td>
</tr>
</tbody>
</table>
Levels and trends in maternal mortality

- **Levels**
  - Abnormally high adult mortality (3 to 5 times that of model life tables with same $e^0(60)$)
  - Due to chronic infections: HIV/AIDS and PTB
  - And to external causes (accidents, violence)

- **Trends**
  - Increasing trend in adult mortality from 2001 to 2007
  - Increasing trend in maternal mortality (+29%; $P<0.004$)
  - Decreasing proportion in maternal deaths
Risk attributable to the maternal period

- Comparison
  - Deaths expected from mortality among non-pregnant women
  - Deaths during maternal period
- Attributable risk
  - Observed / Expected number of deaths
  - Census, 2001: AR = 0.69
  - Community Survey, 2007: AR = 0.57
  - No increased risk associated with pregnancy and delivery! (pregnancy and delivery are protective)
  - New situation, very different from pre-AIDS era, where AR = 1.5 to 2.0
Differential analysis

- Household characteristics / Socio-economic status
  - Urban / Rural
  - Province
  - Race
  - Education
  - Income
  - Wealth

- Community variables / Provincial level
  - HIV/AIDS prevalence
  - External causes
  - Home deliveries
MMR, by area of residence

- **Rural**
  - 2001: 604
  - 2007: 888

- **Urban**
  - 2001: 505
  - 2007: 539

Note: MMR per 100,000 births.
MMR, by province of residence

Western Cape:
- 2007: 175
- 2001: 245

Limpopo:
- 2007: 347
- 2001: 445

Northern Cape:
- 2007: 415
- 2001: 509

Gauteng:
- 2007: 395
- 2001: 555

Mpumalanga:
- 2007: 414
- 2001: 519

Free State:
- 2007: 654
- 2001: 860

Eastern Cape:
- 2007: 712
- 2001: 1236

North-West:
- 2007: 642
- 2001: 751

Kwazulu Natal:
- 2007: 772
- 2001: 912

MMR, per 100,000 live births
MMR, by level of education

<table>
<thead>
<tr>
<th>Education Level</th>
<th>MMR (per 100,000 births)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 years</td>
<td>899</td>
</tr>
<tr>
<td>5-8 years</td>
<td>753, 703</td>
</tr>
<tr>
<td>9-11 years</td>
<td>598, 595</td>
</tr>
<tr>
<td>12+ years</td>
<td>382, 258</td>
</tr>
</tbody>
</table>
MMR, by income per capita

Income per capita (ZAR)

None declared < 2400 < 4800 < 9600 < 28800 >=28800

MMR, per 100,000 births

2001 2007

< 2400 < 4800 < 9600 < 28800 >=28800

None declared
MMR, by absolute wealth index

Wealth index (number of modern items in household)
MMR, by HIV prevalence provinces of South Africa

CS-2001
\( r = 0.73 \)

CS-2007
\( r = 0.59 \)
MMR, by proportion of home deliveries, provinces of South Africa

Correlation coefficient: $r = +0.29$

Provinces:
- NW
- FS
- KZN
- GT
- NC
- MP
- EC
- WC
- LP

Proportion of home deliveries:
- 0%
- 5%
- 10%
- 15%
- 20%
- 25%
- 30%

Measurements per 100,000 births:
- CS-2001
Conclusions (I)

- MMR much higher than previously thought
  - Consistent with findings from Agincourt (same MMR)
  - Still within the range of other countries in Africa
  - Unlikely to be over-estimated because of the low proportion of maternal deaths among women 15-49

- MMR has increased in recent years, due to HIV/AIDS & PTB, Accidents & Violence
  - Many hospital studies show a high proportion of maternal deaths due to HIV/AIDS or PTB
  - Evidence of increase in MMR in Cape Town peninsula
  - Evidence from the vital registration system
Conclusions (II)

- Very pronounced maternal mortality differentials in South Africa
  - By race, ethnicity, province
  - Milder by level of education
- Complex relationship with income and wealth:
  - Middle income / average wealth have the highest risks
  - Risks decline with distance from average, except for the poorest
Conclusions (III)

Potential of population censuses for maternal mortality:
- Exhaustive and unbiased
- Large number of deaths, and small confidence intervals
- Potential for differential analysis
- Potential for multivariate analysis at household level

Can be much improved by providing more details on causes of maternal deaths:
- Separate direct cause, indirect causes, external causes
- Provide more details on timing of death (early pregnancy, late pregnancy, delivery, post-partum, post-abortum)
- Question the actual “demographic” definition of MMR
South Africa, Rock Art